INSECT DIVERSITY AND SAND DUNE RESTORATION;

ECOLOGICAL COMMUNITIES AT A MOSS LANDING RESTORATION SITE

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Introduction

Most of the sand dunes on the central coast of California have been disturbed over the past thousands of years due to the widespread of human development. When non-native plants invade plant communities, it changes the ecosystem for animals living there. We believe people should know about insect diversity because they are an essential part of the coastal dune food web, providing food for animals like the Legless Lizards (protected species). Our hypothesis is that restoring sand dunes by removing weeds and planting native vegetation would affect the diversity of the insects in the ecosystem.

The dunes became rich in vegetation and soil when the Native Americans occupied this land. Followed by them, were the Europeans who brought invasive species and caused disturbance to the native community. A 13-year-old restoration site, a 1-year-old restoration site, and a non-restored site were compared by collecting information about the diversity and abundance of insects at each. Thanks to Moss Landing Marine Laboratories, the dune was restored and is in the process of bringing it back. They accomplished this by planting some important plants such as: Silver Bush Lupine (*Lupinus chamissonus*), and California Sage Bush (*Artemsia californica*) etc. The 1 year dune site was taken over by invasive grasses, but thankfully it was restored by a WATCH group (AMJE) with native plants last year. The non-restored dune site was also taken over by invasive grasses, fortunately we restored it with native vegetation after we collected our samples.

Materials and Methods

Methods:

Before entering the field site at Moss Landing Marine Laboratories, we started off by labeling nine zip-lock bags with the age of the dune, the number of the sample and the date (Example: Old Dune A. 12-3-10). We also inserted waterproof labels in each zip-lock bag with the same information just in case the labels on the outside of the zip-lock bags faded away. Each bag was marked and measured equally to contain the same amount.

It was important to be prepared to enter the field site by gathering all the materials in a plastic bin. We had three dune sites to collect data from: the 13-year-old dune restoration site, the 1-year-old restoration site and the non-restored dune site. We started at the 13-year-old dune site and used a compass to follow random coordinates. The coordinates lead us to the nearest lupine bush (Silver Lupine or Yellow Lupine). Beneath the lupine we collected duff and inserted it into a zip-lock bag. A measured line drawn on the bags was the limit of how much duff to collect. Each bag had to be taped on the top to ensure none of the insects would remain inside. These steps were repeated three times at each dune.

Once we finished our sample collections we placed the bags in the freezer so the insects would become nonviable and therefore they would be easier to count. We then laid the leaf litter on paper towels to carefully examine and search for any kind of insect. After placing all the found insects into petri dishes it was necessary to take them to the laboratory to take a closer look, take pictures and measure them. With the use of the Olympus dissecting microscope and DP-71 Olympic camera it was easier to identify the insects and chart our data.

Materials:

- Gloves
- Paper towels
- Insect Vials
- Dissecting Kit
- Petri dishes
- Zip-lock bags
- Nokia phones
- Compass
- Picture of lupine
- Data Table with coordinates
- Freezer
- Olympus Dissecting microscope with a DP-71 Olympus camera
- Computer
- Clear tape

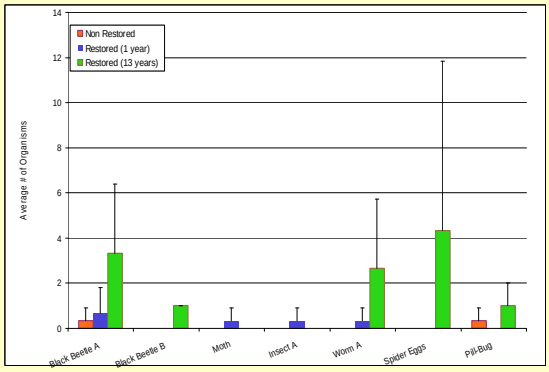


Figure 1: Average number of edible organisms at each site. Error bars = std. dev.

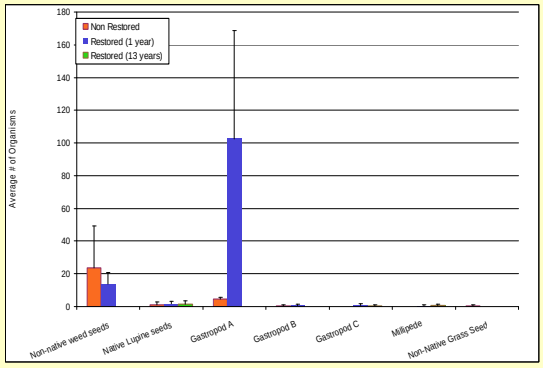


Figure 2. Average number of non-edible organisms at each site. Error bars = std. dev.

Sampling bag from which we collected our samples.

Silver Bush Lupine from the 13 year old restored dune.

Results

See Figures 1 and 2. The abundance and diversity of organisms at each site differed.

Our results below were broken up into two sections. Edible, meaning that they are important to the sand dune food web. Non-edible, meaning that they are less important to the sand dune food web.

Edible

Our results shows that the abundance and diversity is found in the 13 year old dune. When compared to the 1 year old and non-restored dune site we noticed that it contains a greater abundance of diverse edible insects including: Black Beetle A(avg.3.33,std.dev.3.06) and B(avg.1,std.dev.0), Worm A(avg.2.66,std.dev.3.06), Spider Eggs(avg.4.33,std.dev.7.51), and Pill bugs(avg.1,std.dev.1), but it did not have the highest amount of abundance between all the dune sites.

Non-Edible

Our results also show a high abundance of non edible seeds and gastropods. Our graph demonstrates that the 1year old dune has a large abundance in gastropods (avg.102.33, std.dev.66.5). The abundance of non-native weed seeds is also shown in the non-restored dune. As noticed the 1 year and non-restored dune did not contain much edible organisms in comparison to the 13 year old dune.

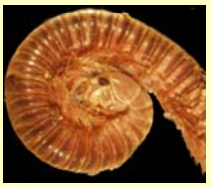
Conclusion

Our results concluded that the 13-year-old restored dune has the greatest abundance and diversity of edible insects. Although the 1-year-old restored dune had the highest abundance of organisms, the high population was gastropods, which are invasive and do not provide food for important species like legless lizards.

Our research showed that a diverse set of native plants does indeed help the diversity of insects, bugs and worms. For a healthy ecological community on the dunes you need plant biodiversity and a high abundance of many species of insects.

The first step for biological succession was completed when we began restoration on a site on the dune in January 2011. We planted nitrogen fixers such as Yellow Bush lupine and Silver Bush Lupine. Succession is a long-term process so hopefully other people in the future will help keep the dune healthy and one day we will see the ultimate transformation - an Oak Woodland.

Gastropod A



Millipede

Pill-Bug

Insect A

Moth

Gastropod B

Literature Cited

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Further Information

- http://amje-returnoftheoakwoodlands.blogspot.com